

Claims:

1. A locking nut and bolt system comprising:

a bolt having a bolt stem and a bolt thread on an axial centerline thereon, said bolt thread defining bolt thread crests and bolt thread troughs;

a plurality of notches defined on said bolt thread generally longitudinally in a predetermined pattern with proximal notches being longitudinally adjacent each other on said bolt thread, each notch having a lock face and an opposing slope;

a nut having a nut thread defined in an internal passageway and an end face, said nut thread being complementary to said bolt thread;

a recess defined on said end face of said nut, said recess having a central region, a recessional mouth open to said internal passageway and a tangential cavity tangentially disposed with respect to said nut thread and having a predetermined shape;

an elongated tine having a planar body, a distal tine end angularly disposed at an offset position with respect to said planar tine body and adapted to ride on said bolt thread crest and fall into at least one of said plurality of notches, and said tine having a proximal end formed as loop, said proximal end loop shaped complementary to said tangential cavity shape;

whereby said proximal end loop of said tine is disposed in said tangential cavity of said recess and said recess defines a radial space behind said tine body such that said tine body moves radially within said radial space of said recess when said distal tine end rides atop said bolt thread crest and moves radially inward when said distal tine end moves into said at least one of said plurality of notches, and said lock face of said notch preventing counter-rotational movement of said bolt with respect to said nut when said distal tine end abuts said lock face.

1 2. A locking nut and bolt system as claimed in claim 1 wherein said recessional central
2 region is substantially co-planar with said tangential cavity and said proximal end loop is U-shaped
3 with each leg being disposed in substantially parallel planes whereby said proximal end loop exerts
4 opposing spring forces against nut walls forming said tangential cavity.

5 3. A locking nut and bolt system as claimed in claim 1 wherein said tangential cavity is
6 angularly offset with respect to said central region of said recess and said proximal end loop of said
7 tine is U-shaped and is offset with respect to said planar tine body, said U-shaped proximal end loop
8 exerting radially directed, opposing spring forces against nut walls forming said tangential cavity.

9 4. A locking nut and bolt system as claimed in claim 1 wherein said planar tine body is
10 disposed in a tangential plane with respect to said axial centerline of said bolt and said proximal end
11 loop is perpendicular with respect to said planar tine body, said proximal end loop is a solid planar
12 element sized to fit within said tangential cavity.

13 5. A locking nut and bolt system as claimed in claim 1 wherein said plurality of notches are
14 longitudinally aligned.

15 6. A locking nut and bolt system as claimed in claim 1 wherein said plurality of notches are
16 disposed in a spiral on said bolt thread.

17 7. A locking nut and bolt system comprising:
18 a bolt having a bolt stem along an axial centerline and a bolt thread formed on said bolt stem,
19 said bolt thread defining bolt thread crests and bolt thread troughs;
20 a plurality of notches defined on said bolt thread generally longitudinally in a predetermined
21 pattern with proximal notches being longitudinally adjacent each other on said bolt thread, each
22 notch having a lock face and an opposing slope;

1 a nut having a nut thread defined in an internal passageway and an end face, said nut thread
2 being complementary to said bolt thread;

3 a recess defined on said end face of said nut and a shoulder defined on a periphery of said
4 recess below said nut end face;

5 a nut insert disposed in said recess on said shoulder, said nut insert having a planar body
6 defined as a peripheral ring about said nut thread, said nut insert having at least one tine depending
7 from said planar peripheral ring body in a substantially tangential plane with respect to said axial
8 centerline of said bolt, said tine having a distal tine end adapted to latch on said lock face of said
9 notch and a proximal tine portion adjacent said peripheral planar body of said nut insert;

10 said planar peripheral ring defining a radial free space axially there below in said nut recess
11 such that said distal tine end of said axially tangential tine moves radially inward when said distal
12 tine end is disposed in one or more notches and moves radially outward into said radial free space
13 when said distal tine end rides on said bolt thread crest, and said lock face of said notch preventing
14 counter-rotational movement of said bolt with respect to said nut when said distal tine end abuts said
15 lock face.

16 8. A locking nut and bolt system as claimed in claim 7 wherein said planar peripheral ring
17 defines one of a key and a keyway and said nut recess defines one of a complementary keyway and
18 a complementary key thereby permitting circumferential alignment of said nut insert with respect
19 to said nut.

20 9. A locking nut and bolt system as claimed in claim 7 wherein said nut insert includes a
21 plurality of tines circumferentially disposed about a radially inward edge of said planar peripheral
22 ring of said nut insert, each tine having a respective planar body which is generally tangentially

1 disposed with respect to said axial centerline and said respective distal tine end angularly disposed
2 and radially inwardly disposed away from said tine planar body.

3 10. A locking nut and bolt system as claimed in claim 7 wherein said nut insert includes a
4 plurality of tines circumferentially disposed and wherein said planar peripheral ring of said nut insert
5 includes a corresponding planar support plate for each of said plurality of tines, each said planar
6 support plate extending radially inward toward said axial centerline thereby creating said radial free
7 space for the radial movement of said tine there beneath and radially spacing said movable tine away
8 from said shoulder of said recess.

9 11. A locking nut and bolt system as claimed in claim 10 wherein said planar peripheral plate
10 includes an outer peripheral planar section from which extends said corresponding planar support
11 plates, said outer peripheral planar section having a radial dimension substantially equivalent to said
12 shoulder in said recess.

13 12. A locking nut and bolt system as claimed in claim 7 wherein said plurality of notches are
14 longitudinally aligned.

15 13. A locking nut and bolt system as claimed in claim 7 wherein said plurality of notches
16 are disposed in a spiral on said bolt thread.

17 14. A locking nut and bolt system comprising:
18 a bolt having a bolt stem along and an axial centerline and a bolt thread formed on said bolt
19 stem, said bolt thread defining bolt thread crests and bolt thread troughs;
20 a plurality of notches defined on said bolt thread generally longitudinally in a predetermined
21 pattern with proximal notches being longitudinally adjacent each other on said bolt thread, each
22 notch having a lock face and an opposing slope;

1 a nut having a nut thread defined in an internal passageway and an end face, said nut thread
2 being complementary to said bolt thread;

3 a recess defined on said end face of said nut below said nut end face;

4 an elongated locking unit formed as a cylinder with at least one tine protruding tangentially
5 and radially inward toward said axial centerline, said locking unit having an axially rearward ring
6 member disposed in said nut recess, said tine having a distal tine end adapted to latch on said lock
7 face of said notch and a proximal tine portion adjacent said cylinder;

8 said distal tine end moves radially inward when said distal tine end is disposed in one or more
9 notches and moves radially outward when said distal tine end rides on said bolt thread crest, and said
10 radially inward and outward movement being visible due to the disposition of said elongated locking
11 unit on said end face of said nut, and said lock face of said notch preventing counter-rotational
12 movement of said bolt with respect to said nut when said distal tine end abuts said lock face.

13 15. A locking nut and bolt system as claimed in claim 14 wherein said cylinder carries a
14 plurality of tines protruding tangentially and radially toward said axial centerline, said plurality of
15 tines disposed circumferentially about said cylinder.

16 16. A locking nut and bolt system as claimed in claim 15 wherein said plurality of tines is
17 disposed axially and circumferentially along said cylinder.

18 17. A locking nut and bolt system as claimed in claim 15 wherein each tine of said plurality
19 of tines is disposed in a respective arcuate cut-out on said cylinder whereby visibility of the locking
20 action of said tine is enhanced.

21 18. A locking nut and bolt system as claimed in claim 17 wherein said rearward ring of said
22 cylinder includes one of a key and a keyway, said nut recess defining one of a complementary

1 keyway and key whereby said locking unit is keyed to a predetermined position with respect to said
2 nut by alignment of said key and complementary keyway.

3 19. A locking nut and bolt system as claimed in claim 14 wherein said plurality of notches
4 are longitudinally aligned.

5 20. A locking nut and bolt system as claimed in claim 14 wherein said plurality of notches
6 are disposed in a spiral on said bolt thread.

7 21. A locking nut and bolt system comprising:

8 a bolt having a bolt stem along and an axial centerline and a bolt thread formed on said bolt
9 stem, said bolt thread defining bolt thread crests and bolt thread troughs;

10 a plurality of notches defined on said bolt thread generally longitudinally in a predetermined
11 pattern with proximal notches being longitudinally adjacent each other on said bolt thread, each
12 notch having a lock face and an opposing slope;

13 a nut having a nut thread defined in an internal passageway and an end face, said nut thread
14 being complementary to said bolt thread;

15 a recess defined on said end face of said nut below said nut end face and a shallow radial
16 ledge peripherally disposed about said recess;

17 an elongated locking unit formed as a cylinder with at least one tine protruding tangentially
18 and radially inward toward said axial centerline, said locking unit sized to fit within said nut recess,
19 said locking unit having an axial end ring member disposed on said shallow radial ledge, said tine
20 having a distal tine end adapted to latch on said lock face of said notch and a proximal tine portion
21 adjacent said cylinder;

1 said distal tine end moves radially inward when said distal tine end is disposed in one or more
2 notches and moves radially outward when said distal tine end rides on said bolt thread crest, and said
3 radially inward and outward movement being visible due to the disposition of said elongated locking
4 unit on said end face of said nut, and said lock face of said notch preventing counter-rotational
5 movement of said bolt with respect to said nut when said distal tine end abuts said lock face.

6 22. A locking nut and bolt system as claimed in claim 21 wherein said axial end ring
7 member includes at least one V-shaped cut-out along its periphery to enable fixation by swaging with
8 said nut end face.

9 23. A locking nut and bolt system comprising:
10 a bolt having a bolt stem along and an axial centerline and a bolt thread formed on said bolt
11 stem, said bolt thread defining bolt thread crests and bolt thread troughs;

12 a plurality of notches defined on said bolt thread generally longitudinally in a predetermined
13 pattern with proximal notches being longitudinally adjacent each other on said bolt thread, each
14 notch having a lock face and an opposing slope;

15 a nut having a nut thread defined in an internal passageway and an end face, said nut thread
16 being complementary to said bolt thread;

17 a recess defined on said end face of said nut below said nut end face and a shallow radial
18 ledge peripherally disposed about said recess;

19 two elongated locking units, each elongated locking unit formed as a cylinder with at least
20 one tine protruding tangentially and radially inward toward said axial centerline, at least one said
21 locking unit sized to fit within said nut recess, each said locking unit having an axial end ring
22 member;

1 means for mounting one elongated locking unit atop said other locking unit by interfacing
2 respective axial end ring together;

3 said one locking unit disposed in said nut recess and said interfaced axial end rings disposed
4 on said shallow radial ledge of said nut end face;

5 each said tine having a distal tine end adapted to latch on said lock face of said notch and a
6 proximal tine portion adjacent a corresponding cylinder;

7 each said distal tine end moves radially inward when said distal tine end is disposed in one
8 or more notches and moves radially outward when said distal tine end rides on said bolt thread crest,
9 and said radially inward and outward movement being visible due to the disposition of said
10 elongated locking unit on said end face of said nut, and said lock face of said notch preventing
11 counter-rotational movement of said bolt with respect to said nut when said distal tine end abuts said
12 lock face.

13 24. A locking nut utilized with a bolt having a bolt stem and a bolt thread on an axial
14 centerline thereon, said bolt thread defining bolt thread crests and bolt thread troughs, said bolt
15 thread carrying a plurality of notches generally longitudinally in a predetermined pattern with
16 proximal notches being longitudinally adjacent each other on said bolt thread, each notch having a
17 lock face and an opposing slope, said locking nut comprising:

18 a metal sheet bent to form first, second, third and fourth generally planar sides, said first and
19 third sides in opposition and said second and fourth sides defining opposing nut end faces;

20 a nut thread formed on one of said second and said fourth sides, said nut thread disposed
21 about an axial centerline and being complementary to said bolt thread;

1 a locking unit formed on at least one of said first and third sides, said locking unit having at
2 least one tine protruding tangentially and radially inward toward said axial centerline, said tine
3 having a distal tine end adapted to latch on said lock face of said notch and a proximal tine portion
4 adjacent said one of said first and third sides;

5 said distal tine end being adapted to move radially inward when said distal tine end is
6 disposed in one or more notches and move radially outward when said distal tine end rides on said
7 bolt thread crest.

8 25. A locking nut insert utilized with an elongated bolt having a stem and a bolt thread
9 on said stem, said bolt thread defining bolt thread crest and bolt thread troughs, said bolt having a
10 plurality of notches defined on said bolt thread generally longitudinally in a predetermined pattern
11 with proximal notches being longitudinally adjacent each other on said bolt thread, each notch
12 having a lock face and an opposing slope on said bolt thread which form a locking channel on said
13 stem, said nut insert comprising:

14 a nut shell having a recess therein about an axial centerline;

15 an elongated locking unit formed as a cylinder with its cylindrical axis coaxial with said axial
16 centerline, said locking unit having at least one tine protruding tangentially and radially inward
17 toward said cylindrical axis, said tine having a distal tine end adapted to latch on said lock face of
18 said notch and a proximal tine portion adjacent said cylinder, said cylinder defining a cut-out at said
19 tine;

20 a nut formed on an axial inboard end of said cylinder, said nut having a nut thread about an
21 axial centerline which is complementary to said bolt thread;

22 said locking unit and nut substantially fully inserted into said recess of said nut shell;

1 said distal tine end being adapted to move radially inward when said distal tine end is
2 disposed in one or more notches and move radially outward when said distal tine end rides on said
3 bolt thread crest thereby permitting only one way rotational movement of said bolt with respect to
4 said locking unit.

5 26. A locking assembly for a pipe or rod having a threaded end and a plurality of axial
6 notches inboard said threaded end, said locking assembly comprising:

7 a cylindrical body defining a nut thread complementary to said threaded end, said nut thread
8 defining an axial centerline;

9 a locking unit formed in said cylindrical body at a medial position of said nut thread, said
10 locking unit having at least one tine protruding tangentially and radially inward toward said axial
11 centerline, said tine having a distal tine end adapted to latch in said notches of said pipe or rod;

12 said distal tine end being adapted to move radially inward when said distal tine end is
13 disposed in one or more notches and move radially outward when said distal tine end rides outside
14 of said notches.

15 27. A locking nut and bolt system comprising:

16 a bolt having a bolt stem along and an axial centerline and a bolt thread formed on said bolt
17 stem, said bolt thread defining bolt thread crests and bolt thread troughs;

18 a plurality of notches defined on said bolt thread generally longitudinally in a predetermined
19 pattern with proximal notches being longitudinally adjacent each other on said bolt thread, each
20 notch having a lock face and an opposing slope;

21 a nut having a nut thread defined in an internal passageway and an end face, said nut thread
22 being complementary to said bolt thread;

1 a recess defined on said end face of said nut below said nut end face;

2 a locking element having an axially rearward ring member disposed in said nut recess and
3 having a plurality of axially protruding legs and a corresponding plurality of tines, each tine
4 protruding tangentially and radially inward toward said axial centerline, said axially protruding legs
5 depending from said rearward ring member, each said tine having a distal tine end adapted to latch
6 on said lock face of said notch and a proximal tine portion attached to said corresponding axially
7 protruding leg;

8 each distal tine end moves radially inward when said distal tine end is disposed in one or
9 more notches and moves radially outward when said distal tine end rides on said bolt thread crest,
10 and said radially inward and outward movement being visible due to the disposition of said locking
11 element on said end face of said nut, and said lock face of said notch preventing counter-rotational
12 movement of said bolt with respect to said nut when said distal tine end abuts said lock face.

13 28. A locking nut and bolt system as claimed in claim 27 wherein said plurality of axially
14 protruding legs and corresponding plurality of tines are circumferentially disposed.

15 29. A locking nut and bolt system as claimed in claim 28 wherein said rearward ring member
16 is swaged to said nut.

17 30. A locking nut and bolt system as claimed in claim 27 wherein said rearward ring includes
18 one of a key and a keyway, said nut recess defining one of a complementary keyway and key
19 whereby said locking element is keyed to a predetermined position with respect to said nut by
20 alignment of said key and complementary keyway.

21 31. An S-shaped locking nut and bolt assembly for a bored panel comprising:

1 an elongated bolt having a stem and a bolt thread on said stem, said bolt thread defining bolt
2 thread crest and bolt thread troughs, said bolt having a plurality of notches defined on said bolt
3 thread generally longitudinally in a predetermined pattern with proximal notches being longitudinally
4 adjacent each other on said bolt thread, each notch having a lock face and an opposing slope on said
5 bolt thread which form a locking channel on said stem;

6 an S-shaped member having first, second and third elongated, generally planar legs;

7 a nut formed on one of said second and said third legs, said nut having a nut thread about an
8 axial centerline which is complementary to said bolt thread;

9 an elongated locking unit formed on the other of said second and third legs, said locking unit
10 formed as a perpendicular structure with a locking axis perpendicular to the plane of said other leg,
11 said locking unit having at least one tine protruding tangentially and radially inward toward said
12 locking axis, said tine having a distal tine end adapted to latch on said lock face of said notch and
13 a proximal tine portion adjacent said perpendicular structure, said perpendicular structure defining
14 a cut-out at said tine;

15 said S-shaped member adapted to be mounted on said panel with said axial centerline of said
16 nut, said panel bore and said locking axis of said locking unit being substantially coaxially aligned;

17 said distal tine end being adapted to move radially inward when said distal tine end is
18 disposed in one or more notches and move radially outward when said distal tine end rides on said
19 bolt thread crest, and the position of said distal tine end being visible due to the disposition of said
20 elongated locking unit on said third leg.

1 32. A locking nut and bolt assembly as claimed in claim 31 wherein said perpendicular
2 structure is a cylinder and carries a plurality of tines protruding tangentially and radially toward said
3 axial centerline, said plurality of tines disposed circumferentially about said cylinder.

4 33. An S-shaped locking nut and bolt assembly for a bored panel comprising:
5 an elongated bolt having a stem and a bolt thread on said stem, said bolt thread defining bolt
6 thread crest and bolt thread troughs, said bolt having a plurality of notches defined on said bolt
7 thread generally longitudinally in a predetermined pattern with proximal notches being longitudinally
8 adjacent each other on said bolt thread, each notch having a lock face and an opposing slope on said
9 bolt thread which form a locking channel on said stem;

10 an S-shaped member having first, second and third elongated, generally planar legs;

11 a nut formed on one of said second and said third legs, said nut having a nut thread about an
12 axial centerline which is complementary to said bolt thread;

13 a locking element formed on the other of said second and third legs, said locking element
14 having a locking element bore coaxial with respect to said axial centerline, said locking element
15 having a plurality of axially protruding legs perpendicular to said planar other leg and having a
16 corresponding plurality of tines, each tine protruding tangentially and radially inward toward said
17 axial centerline, said axially protruding legs depending from said planar other leg, each said tine
18 having a distal tine end adapted to latch on said lock face of said notch and a proximal tine portion
19 attached to said corresponding axially protruding leg;

20 said S-shaped member adapted to be mounted on said panel with said axial centerline of said
21 nut, said panel bore and said locking element bore being substantially coaxially aligned;

1 one of said plurality of distal tine ends being adapted to move radially inward when said
2 distal tine end is disposed in one or more notches and move radially outward when said distal tine
3 end rides on said bolt thread crest, and the position of said distal tine end being visible due to the
4 disposition of said elongated locking element on said third leg.

5 34. A locking nut and bolt assembly as claimed in claim 31 wherein said plurality of tines
6 are disposed circumferentially about said locking element bore.

7 35. An S-shaped locking nut assembly for a bored panel and an elongated bolt having a stem
8 and a bolt thread on said stem, said bolt thread defining bolt thread crest and bolt thread troughs, said
9 bolt having a plurality of notches defined on said bolt thread generally longitudinally in a
10 predetermined pattern with proximal notches being longitudinally adjacent each other on said bolt
11 thread, each notch having a lock face and an opposing slope on said bolt thread which form a locking
12 channel on said stem, said locking nut assembly comprising:

13 an S-shaped member having first, second and third elongated, generally planar legs;

14 a nut formed on one of said second and said third legs, said nut having a nut thread about an
15 axial centerline which is complementary to said bolt thread;

16 an elongated locking unit formed on the other of said second and said third legs, said locking
17 unit formed as a cylinder with its cylindrical axis perpendicular to the plane of said other leg, said
18 locking unit having at least one tine protruding tangentially and radially inward toward said
19 cylindrical axis, said tine having a distal tine end adapted to latch on said lock face of said notch and
20 a proximal tine portion adjacent said cylinder, said cylinder defining a cut-out at said tine;

1 said S-shaped member adapted to be mounted on said panel with said axial centerline of said
2 nut, said panel bore and said cylindrical axis of said locking unit being substantially coaxially
3 aligned;

4 said distal tine end being adapted to move radially inward when said distal tine end is
5 disposed in one or more notches and move radially outward when said distal tine end rides on said
6 bolt thread crest, and the position of said distal tine end being visible due to the disposition of said
7 elongated locking unit on said other leg.

8 36. A locking nut assembly as claimed in claim 35 wherein said cylinder carries a plurality
9 of tines protruding tangentially and radially toward said axial centerline, said plurality of tines
10 disposed circumferentially about said cylinder.

11 37. An S-shaped locking nut assembly for a bored panel and an elongated bolt having a stem
12 and a bolt thread on said stem, said bolt thread defining bolt thread crest and bolt thread troughs, said
13 bolt having a plurality of notches defined on said bolt thread generally longitudinally in a
14 predetermined pattern with proximal notches being longitudinally adjacent each other on said bolt
15 thread, each notch having a lock face and an opposing slope on said bolt thread which form a locking
16 channel on said stem, said locking nut assembly comprising:

17 an S-shaped member having first, second and third elongated, generally planar legs;

18 a nut formed on one of said second and said third legs, said nut having a nut thread about an
19 axial centerline which is complementary to said bolt thread;

20 a locking element formed on the other of said second and said third legs, said locking element
21 having a locking element bore coaxial with respect to said axial centerline, said locking element
22 having a plurality of axially protruding legs perpendicular to said planar other leg and having a

1 corresponding plurality of tines, each tine protruding tangentially and radially inward toward said
2 axial centerline, said axially protruding legs depending from said planar other leg, each said tine
3 having a distal tine end adapted to latch on said lock face of said notch and a proximal tine portion
4 attached to said corresponding axially protruding leg;

5 said S-shaped member adapted to be mounted on said panel with said axial centerline of said
6 nut, said panel bore and said locking element bore being substantially coaxially aligned;

7 one of said plurality of distal tine ends being adapted to move radially inward when said
8 distal tine end is disposed in one or more notches and move radially outward when said distal tine
9 end rides on said bolt thread crest, and the position of said distal tine end being visible due to the
10 disposition of said elongated locking element on said other leg.

11 38. A locking nut assembly as claimed in claim 37 wherein said plurality of tines are
12 disposed circumferentially about said locking element bore.

13 39. An S-shaped locking nut and bolt assembly for a bored panel comprising:

14 an elongated bolt having a stem and a bolt thread on said stem, said bolt thread defining bolt
15 thread crest and bolt thread troughs, said bolt having a plurality of notches defined on said bolt
16 thread generally longitudinally in a predetermined pattern with proximal notches being longitudinally
17 adjacent each other on said bolt thread, each notch having a lock face and an opposing slope on said
18 bolt thread which form a locking channel on said stem;

19 an S-shaped member having first, second and third elongated, generally planar legs;

20 said first and second legs defining coaxial through bores and defining a common axis;

21 an elongated locking unit formed on said third leg, said locking unit formed as a cylinder
22 with its cylindrical axis perpendicular to the plane of said leg and coaxial with said common axis,

1 said locking unit having at least one tine protruding tangentially and radially inward toward said
2 cylindrical axis, said tine having a distal tine end adapted to latch on said lock face of said notch and
3 a proximal tine portion adjacent said cylinder, said cylinder defining a cut-out at said tine;

4 a nut formed on an axial inboard end of said cylinder, said nut having a nut thread about an
5 axial centerline which is complementary to said bolt thread;

6 said S-shaped member adapted to be mounted on said panel with said axial centerline of said
7 nut, said panel bore and said cylindrical axis of said locking unit being substantially coaxially
8 aligned;

9 said distal tine end being adapted to move radially inward when said distal tine end is
10 disposed in one or more notches and move radially outward when said distal tine end rides on said
11 bolt thread crest, and the position of said distal tine end being visible due to the disposition of said
12 elongated locking unit on said third leg.

13 40. An S-shaped assembly as claimed in claim 39 wherein said second leg includes an
14 alignment cylinder coaxial with said common axis and sized to capture said nut therein.

15 41. A U- or a J-shaped clip and locking nut assembly for a bored panel and an elongated
16 bolt having a stem and a bolt thread on said stem, said bolt thread defining bolt thread crest and bolt
17 thread troughs, said bolt having a plurality of notches defined on said bolt thread generally
18 longitudinally in a predetermined pattern with proximal notches being longitudinally adjacent each
19 other on said bolt thread, each notch having a lock face and an opposing slope on said bolt thread
20 which form a locking channel on said stem, said locking nut assembly comprising:

21 a U or a J-shaped clip member having first and second elongated, generally planar legs;

1 a single thread nut having an arc less than 360 degrees formed on said first leg about a nut
2 bore having an axial centerline;

3 a locking element formed on said second leg and defining a locking element bore coaxial
4 with said axial centerline, said locking element having a at least one axially protruding leg
5 perpendicular to said planar second leg and having at least one tine, said tine protruding tangentially
6 and radially inward toward said axial centerline, said axially protruding leg depending from said
7 planar second leg, said tine having a distal tine end adapted to latch on said lock face of said notch
8 and a proximal tine portion attached to said axially protruding leg;

9 said clip member adapted to be mounted on said panel with said axial centerline of said nut,
10 said panel bore and said locking element bore being substantially coaxially aligned;

11 said distal tine end being adapted to move radially inward when said distal tine end is
12 disposed in one or more notches and move radially outward when said distal tine end rides on said
13 bolt thread crest, and the position of said distal tine end being visible due to the disposition of said
14 elongated locking element on said second leg.

15 42. A locking nut assembly as claimed in claim 41 including a plurality of axially protruding
16 legs, each carrying a respective tine thereon, said axially protruding legs being circumferentially
17 disposed about said axial centerline.

18 43. A U-shaped locking nut assembly for a bored panel and an elongated bolt having a stem
19 and a bolt thread on said stem, said bolt thread defining bolt thread crest and bolt thread troughs, said
20 bolt having a plurality of notches defined on said bolt thread generally longitudinally in a
21 predetermined pattern with proximal notches being longitudinally adjacent each other on said bolt

1 thread, each notch having a lock face and an opposing slope on said bolt thread which form a locking
2 channel on said stem, said locking nut assembly comprising:

3 a U-shaped member having a first and a second elongated, generally planar leg;

4 a single thread nut having an arc less than 360 degrees formed on said first leg about a nut
5 bore having an axial centerline;

6 an elongated locking unit formed on said second leg formed as a cylinder with its cylindrical
7 axis perpendicular to the plane of said second leg, said locking unit having at least one tine
8 protruding tangentially and radially inward toward said cylindrical axis, said tine having a distal tine
9 end adapted to latch on said lock face of said notch and a proximal tine portion adjacent said
10 cylinder, said cylinder defining a cut-out at said tine;

11 said U-shaped member adapted to be mounted on said panel with said axial centerline of said
12 nut, said panel bore and said cylindrical axis of said locking unit being substantially coaxially
13 aligned;

14 said distal tine end being adapted to move radially inward when said distal tine end is
15 disposed in one or more notches and move radially outward when said distal tine end rides on said
16 bolt thread crest, and the position of said distal tine end being visible due to the disposition of said
17 elongated locking unit on said second leg.

18 44. A locking nut assembly as claimed in claim 43 wherein said cylinder carries a plurality
19 of tines disposed circumferentially about said cylinder.

20 45. A U-shaped locking nut assembly for a bored panel and an elongated bolt having a stem
21 and a bolt thread on said stem, said bolt thread defining bolt thread crest and bolt thread troughs, said
22 bolt having a plurality of notches defined on said bolt thread generally longitudinally in a

1 predetermined pattern with proximal notches being longitudinally adjacent each other on said bolt
2 thread, each notch having a lock face and an opposing slope on said bolt thread which form a locking
3 channel on said stem, said locking nut assembly comprising:

4 a U-shaped member having first and second elongated, generally planar legs;

5 a single thread nut having an arc less than 360 degrees formed on said first leg about a nut
6 bore having an axial centerline;

7 a locking element formed on said first leg beyond said arc of said nut thread and on said nut
8 bore, said locking element having an axially protruding leg perpendicular to said planar first leg and
9 having a corresponding tine protruding tangentially and radially inward toward said axial centerline,
10 said axially protruding leg depending from said planar first leg on said nut bore, said tine having a
11 distal tine end adapted to latch on said lock face of said notch and a proximal tine portion attached
12 to said axially protruding leg;

13 said U-shaped member adapted to be mounted on said panel with said axial centerline of said
14 nut and said panel bore being substantially coaxially aligned;

15 said distal tine end being adapted to move radially inward when said distal tine end is
16 disposed in one or more notches and move radially outward when said distal tine end rides on said
17 bolt thread crest.

18 46. A locking nut assembly as claimed in claim 45 wherein said single nut thread spans an
19 arc less than 360 degrees and said axially protruding leg is circumferentially disposed on said nut
20 bore beyond said single thread arc.

1 47. A locking nut assembly as claimed in claim 46 wherein said single thread nut arc is
2 severed into a plurality of arcs and a plurality of axially protruding legs are disposed intermediate
3 said severed thread arcs.

4 48. A locking nut assembly as claimed in claim 46 wherein said second leg is truncated.

5 49. A locking nut assembly as claimed in claim 46 wherein said second leg defines a bore
6 coaxial with said axial centerline.

7 50. A U-shaped locking nut assembly for a bored panel and an elongated bolt having a stem
8 and a bolt thread on said stem, said bolt thread defining bolt thread crest and bolt thread troughs, said
9 bolt having a plurality of notches defined on said bolt thread generally longitudinally in a
10 predetermined pattern with proximal notches being longitudinally adjacent each other on said bolt
11 thread, each notch having a lock face and an opposing slope on said bolt thread which form a locking
12 channel on said stem, said locking nut assembly comprising:

13 a U-shaped member having a first and a second elongated, generally planar leg;

14 a nut formed on said first leg, said nut having a nut thread about an axial centerline which
15 nut thread is complementary to said bolt thread;

16 an elongated locking unit formed as a cylinder on an outboard axial end of said nut, said
17 locking unit having at least one tine protruding tangentially and radially inward toward said axial
18 centerline, said tine having a distal tine end adapted to latch on said lock face of said notch and a
19 proximal tine portion adjacent said cylinder;

20 said U-shaped member adapted to be mounted on said panel with said axial centerline of said
21 nut, said panel bore and said cylinder of said locking unit being substantially coaxially aligned;

1 said distal tine end being adapted to move radially inward when said distal tine end is
2 disposed in one or more notches and move radially outward when said distal tine end rides on said
3 bolt thread crest, and the position of said distal tine end being visible due to the disposition of said
4 elongated locking unit on said nut.

5 51. A locking nut assembly as claimed in claim 50 wherein said cylinder carries a plurality
6 of tines protruding tangentially and radially toward said axial centerline, said plurality of tines
7 disposed circumferentially about said cylinder.

8 52. A U-shaped locking nut assembly for a bored panel and an elongated bolt having a stem
9 and a bolt thread on said stem, said bolt thread defining bolt thread crest and bolt thread troughs, said
10 bolt having a plurality of notches defined on said bolt thread generally longitudinally in a
11 predetermined pattern with proximal notches being longitudinally adjacent each other on said bolt
12 thread, each notch having a lock face and an opposing slope on said bolt thread which form a locking
13 channel on said stem, said locking nut assembly comprising:

14 a U-shaped member having a first and a second elongated, generally planar leg;

15 a nut formed as an elongated, thin walled cylinder on said first leg, said nut having a nut
16 thread about an axial centerline which nut thread is complementary to said bolt thread;

17 a locking unit formed on an interior of said nut, said locking unit having a tine protruding
18 tangentially and radially inward toward said axial centerline, said tine formed from a segment of said
19 thin walled cylinder, said tine having a distal tine end adapted to latch on said lock face of said notch
20 and a proximal tine portion adjacent said cylinder;

21 said U-shaped member adapted to be mounted on said panel with said axial centerline of said
22 nut and said panel bore being substantially coaxially aligned;

1 said distal tine end being adapted to move radially inward when said distal tine end is
2 disposed in one or more notches and move radially outward when said distal tine end rides on said
3 bolt thread crest.

4 53. A locking nut assembly as claimed in claim 52 wherein said tine includes a tine body and
5 said distal tine end is disposed at an offset angle with respect to said tine body.

6 54. A locking nut and bolt system with a latch closure comprising:

7 a bolt having a bolt stem on an axial centerline and a bolt thread formed on said bolt stem,
8 said bolt thread defining bolt thread crests and bolt thread troughs;

9 a plurality of notches defined on said bolt thread generally longitudinally in a predetermined
10 pattern with proximal notches being longitudinally adjacent each other on said bolt thread, each
11 notch having a lock face and an opposing slope;

12 a nut having a nut thread defined in an internal passageway and an end face, said nut thread
13 being complementary to said bolt thread;

14 a recess defined on and below said end face of said nut;

15 an elongated locking unit having a peripheral wall shaped complementary to said recess and
16 having at least one tine protruding tangentially and radially inward away from said peripheral wall
17 and toward said axial centerline, said tine having a distal tine end adapted to latch on said lock face
18 of said notch and a proximal tine portion adjacent said peripheral wall;

19 a latch moveably disposed on said peripheral wall adjacent said proximal tine portion of said
20 tine, said latch moving over said peripheral wall and capturing said tine between said latch and said
21 peripheral wall in a closed position and moving over said peripheral wall and fully exposing said tine
22 in a locking position;

1 with said latch in said locking position, said distal tine end moves radially inward when said
2 distal tine end is disposed in one or more notches and moves radially outward when said distal tine
3 end rides on said bolt thread crest, and said lock face of said notch preventing counter-rotational
4 movement of said bolt with respect to said nut when said distal tine end abuts said lock face.

5 55. A locking nut and bolt system as claimed in claim 54 wherein said latch spans an axial
6 dimension of said tine.

7 56. A locking nut and bolt system as claimed in claim 55 wherein said latch defines one of
8 a channel and a channel member and said peripheral wall defines, at an axially outboard end thereof,
9 one of a complementary channel and a complementary channel member interfit in said one channel
10 and channel member of said latch, said channel and channel member on its respective latch and
11 peripheral wall having a stop which limits movement of said latch with respect to said peripheral
12 wall in said closed position.

13 57. A locking nut and bolt system as claimed in claim 56 wherein said peripheral wall
14 includes a radially extending lip a portion of which defines said channel member and said latch
15 defines said channel member thereat.

16 58. A locking nut and bolt system as claimed in claim 57 wherein said peripheral wall has
17 a substantially rectangular cross-sectional shape.

18 59. A locking nut and bolt system as claimed in claim 56 wherein said peripheral wall has
19 a substantially circular cross-sectional shape.

20 60. A locking nut and bolt system as claimed in claim 59 wherein said peripheral wall
21 defines a cylinder and said latch defines a complementary cylinder disposed inside said cylindrical
22 peripheral wall.

1 61. A locking nut and bolt system as claimed in claim 60 wherein said cylindrical latch
2 includes an axially outboard cap.

3 62. A locking nut and bolt system as claimed in claim 60 wherein said cylindrical peripheral
4 wall includes said channel member and said cylindrical latch includes said channel.

5 63. A locking nut and bolt system as claimed in claim 54 wherein said plurality of notches
6 are longitudinally aligned.

7 64. A locking nut and bolt system as claimed in claim 54 wherein said plurality of notches
8 are disposed in a spiral on said bolt thread.

9 65. A locking nut and bolt system as claimed in claim 60 wherein said cylindrical latch
10 includes a user actuatable control surface to enable said latch to move to and from said locking
11 position with respect to said closed position.

12 66. A locking nut and bolt system comprising:

13 a bolt having a bolt head and a bolt stem along an axial centerline and a bolt thread formed
14 on said bolt stem;

15 a plurality of notches defined on said bolt head, each notch having a lock face and an
16 opposing slope;

17 a female threaded unit with a nut thread defined in an internal passageway about a central
18 axis and said female threaded unit having an end face, said nut thread being complementary to said
19 bolt thread;

20 a recess defined below said end face of said female threaded unit;

21 a locking unit having a peripheral wall complementary to said recess and having at least one
22 tine protruding tangentially and radially inward toward said central axis, said locking unit having a

1 portion thereof disposed in said recess, said tine having a distal tine end adapted to latch on said lock
2 face of said notch and a proximal tine portion adjacent said peripheral wall;

3 said distal tine end moves radially inward when said distal tine end is disposed in one of said
4 notches and moves radially outward when said distal tine end rides on said opposing slope and is
5 otherwise beyond said one of said plurality of notches, and said lock face of each said notch
6 preventing counter-rotational movement of said bolt with respect to said female threaded unit when
7 said distal tine end abuts said lock face.

8 67. A locking nut and bolt system as claimed in claim 66 wherein said locking unit and said
9 peripheral wall have an axially open end whereby said radially inward and outward movement of
10 said distal tine end is visible due to the open axial end of said locking unit.

11 68. A locking nut and bolt system as claimed in claim 66 wherein said tine is defined in a
12 cut-out on said peripheral wall.

13 69. A locking nut and bolt system as claimed in claim 66 wherein said locking unit includes
14 a plurality of tines circumferentially disposed about said central axis.

15 70. A locking nut and bolt system comprising:

16 a bolt having a bolt head and a bolt stem along an axial centerline and a self-threading bolt
17 thread formed on said bolt stem;

18 a plurality of notches defined on said bolt head, each notch having a lock face and an
19 opposing slope;

20 a base unit with an open ended passageway defined therein, said passageway having a central
21 axis and being large enough to accommodate said self-threading bolt thread;

1 a locking unit, mounted onto said base over said open ended passageway, said locking unit
2 having a peripheral wall carrying at least one tine protruding tangentially and radially inward toward
3 said central axis, said tine having a distal tine end adapted to latch on said lock face of said notch
4 and a proximal tine portion adjacent said peripheral wall;

5 said distal tine end moves radially inward when said distal tine end is disposed in one of said
6 notches and moves radially outward when said distal tine end rides on said opposing slope and is
7 otherwise beyond said one of said plurality of notches, and said lock face of each said notch
8 preventing counter-rotational movement of said bolt with respect to said female threaded unit when
9 said distal tine end abuts said lock face.

10 71. A locking nut and bolt system as claimed in claim 70 including a depending leg
11 extending from said locking unit and affixed to said base unit.

12 72. A locking nut and bolt system as claimed in claim 71 including upright pillars
13 extending from said base unit to limit rotation of said locking unit relative to said bolt.

14 73. A removal tool for a locking nut and bolt combination, said locking nut and bolt
15 combination including a bolt with a bolt thread and a nut with a nut thread in an internal passageway
16 complementary to said bolt thread, a plurality of notches on said bolt thread, said nut carrying a
17 locking body having an elongated tine with a proximal tine body portion attached to said locking
18 body and a distal tine end protruding into said internal nut passageway and adapted to ride on said
19 bolt thread and fall into at least one of said plurality of notches dependent upon a relative position
20 of said distal tine end and said plurality of notches, said removal tool comprising:

1 a cylindrical body with an open end carrying a plurality of axially movable, axially outwardly
2 biased, depending legs disposed about said open end at circumferential positions complementary to
3 said bolt thread;

4 wherein said cylindrical body is adapted to be disposed atop said locking body and said bolt
5 thread whereby one of said depending legs is placed intermediate said proximal tine body portion
6 of said elongated tine and said bolt thread and said cylindrical body is rotated thereby lifting said
7 distal tine end away from said plurality of notches.

8 74. A removal tool as claimed in claim 73 wherein said depending legs are captured within
9 guide channels formed on said cylindrical body near said open end.

10 75. A removal tool as claimed in claim 74 wherein said depending legs are axially biased
11 outward by a spring.

12 76. A removal tool as claimed in claim 75 wherein each depending leg moves independently
13 with respect to each other.

14 77. A removal tool as claimed in claim 73 including an outer cylinder complementary to
15 said cylindrical body, said cylindrical body movably disposed inside said outer cylinder, and
16 including a user actuable control surface protruding from said cylindrical body through a hole in said
17 outer cylinder whereby said cylindrical body is rotated with respect to said outer cylinder based upon
18 movement of said control surface.

19 78. A removal tool as claimed in claim 77 wherein said hole forms a partial spiral arc such
20 that said cylindrical body rotates and moves axially outboard based upon the movement of said
21 control surface with respect to said outer cylinder.

1 79. A removal tool as claimed in claim 77 wherein said outer cylinder includes a female
2 socket fitting at an opposing end which is opposite said open end of said cylindrical body.

3 80. A removal tool and locking nut and bolt combination comprising:

4 a bolt with a bolt thread having a plurality of notches on said bolt thread;

5 a nut with a nut thread in an internal passageway complementary to said bolt thread;

6 a locking body carried by said nut along said internal passageway, said locking body having
7 an elongated tine with a proximal tine body portion attached to said locking body and a distal tine
8 end protruding into said internal nut passageway and adapted to ride on said bolt thread and fall into
9 at least one of said plurality of notches dependent upon a relative position of said distal tine end and
10 said plurality of notches;

11 a removal tool including a cylindrical body with an open end carrying a plurality of axially
12 movable, axially outwardly biased, depending legs disposed about said open end at circumferential
13 positions complementary to said bolt thread;

14 wherein said cylindrical body is adapted to be disposed atop said locking body and said bolt
15 thread whereby one of said depending legs is placed intermediate said proximal tine body portion
16 of said elongated tine and said bolt thread and said cylindrical body is rotated thereby lifting said
17 distal tine end away from said plurality of notches.

18 81. A removal tool combination as claimed in claim 80 wherein said depending legs are
19 captured within guide channels formed on said cylindrical body near said open end.

20 82. A removal tool combination as claimed in claim 81 wherein said depending legs are
21 axially biased outward by a spring.

1 83. A removal tool combination as claimed in claim 82 wherein each depending leg moves
2 independently with respect to each other.

3 84. A removal tool combination as claimed in claim 80 including an outer cylinder
4 complementary to said cylindrical body, said cylindrical body movably disposed inside said outer
5 cylinder, and including a user actuatable control surface protruding from said cylindrical body through
6 a hole in said outer cylinder whereby said cylindrical body is rotated with respect to said outer
7 cylinder based upon movement of said control surface.

8 85. A removal tool combination as claimed in claim 84 wherein said hole forms a partial
9 spiral arc such that said cylindrical body rotates and moves axially outboard based upon the
10 movement of said control surface with respect to said outer cylinder.

11 86. A removal tool combination as claimed in claim 84 wherein said outer cylinder includes
12 a female socket fitting at an opposing end which is opposite said open end of said cylindrical body.